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Mercury Concentrations of Fish in Southern Indian Lake and Issett Lake, Manitoba, 1975-88: the Effect of Lake Impoundment and Churchill River Diversion

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MERCURY CONCENTRATIONS OF FISH IN SOUTHERN INDIAN LAKE AND ISSETT LAKE, MANITOBA, 1975-88: THE EFFECT OF LAKE IMPOUNDMENT AND CHURCHILL RIVER DIVERSION

by

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ABSTRACT

Strange, N.E., R.A. Bodaly, and R.J.P. Fudge. 1991. Mercury concentrations of fish in Southern Indian Lake and Issett Lake, Manitoba, 1975-88: the effect of impoundment and Churchill River diversion. Can. Tech. Rep. Fish. Aquat. Sci. 1824: iv + 30 p.

Southern Indian Lake and Issett Lake were flooded in 1976 as part of the Churchill River diversion project. Fish were collected over the period 1975-88 from five regional sites on Southern Indian Lake and from Issett Lake to examine the effects of impoundment and river diversion on muscle mercury concentrations. Species sampled for mercury analysis were lake whitefish, northern pike, walleye, cisco, longnose sucker and burbot. Raw data for individual fish caught in 1987 and 1988 are presented in this report, along with means and analyses calculated over the entire study period (1975-88). Mercury concentrations in whitefish, pike and walleye increased significantly after impoundment. Whitefish mercury levels peaked in 1978, two years after impoundment, and have since declined to near pre-flooding levels. Northern pike and walleye mercury levels were much higher than those for whitefish. Whereas pike mercury concentrations showed no indication of declining 12 years after impoundment, walleye mercury levels at two of the five Southern Indian Lake sites declined from maximum recorded levels. There was significant variability in fish mercury concentrations, both year-to-year and among the sites. It is hypothesized that these site-to-site differences are due to various conditions in the reservoir which stimulate mercury methylation. Because there appears to be an ongoing long-term supply of source mercury and organic material from the eroding shorelines, it is expected that pike and walleye mercury concentrations will remain high for many years. The data illustrate the need for long-term sampling to understand trends and the importance of sampling more than one site on large lakes.

Key words: mercury; lake whitefish; northern pike; walleye; freshwater fish; reservoirs; river diversion; impoundment.

RÉSUMÉ

Strange, N.E., R.A. Bodaly, and R.J.P. Fudge. 1991. Mercury concentrations of fish in Southern Indian Lake and Issett Lake, Manitoba, 1975-88: the effect of impoundment and Churchill River diversion. Can. Tech. Rep. Fish. Aquat. Sci. 1824: iv + 30 p.

Les lacs Indian Sud et Issett ont été inondés en 1976 dans le cadre du projet de déviation de la rivière Churchill. De 1975 à 1988, on a procédé à l'échantillonnage de poissons à cinq stations régionales, dans ces deux lacs, afin d'examiner les effets de la création d'un réservoir et de la déviation des eaux d'un fleuve sur la concentration de mercure dans le tissu musculaire. Les espèces échantillonnées étaient les suivantes: grand corégone, grand brochet, doré, cisco, meunier rouge et lotte. Ce rapport présente les données brutes sur des sujets précis qui ont été capturés en 1987 et 1988; il fournit aussi des moyennes et des résultats d'analyse calculés pour l'ensemble de la période 1975-1988. Chez le grand corégone, le grand brochet et le doré, la concentration de mercure s'est accrue de façon importante après la création du réservoir. Dans le cas du grande corégone, la concentration de mercure a atteint un maximum en 1978, deux ans après la création du réservoir, pour revenir à une valeur très proche de celle que l'on avait observée avant l'inondation. On a observé une concentration en mercure beaucoup plus élevée chez le grand brochet et le doré que chez le grand corégone. Bien qu'on n'ait pas observé chez le grand brochet d'indices d'une diminution de la concentration de mercure 12 ans après la création du réservoir, la concentration de mercure chez de doré dans deux des cinq sites échantillonnés du lac Indian Sud a baissé par rapport au niveau maximal observé. La concentration du mercure dans les tissus des poissons était significativement variable, tant d'une année à l'autre que d'une station à l'autre. On pense que ces différences d'un site à l'autre sont attribuables à différentes conditions observées dans le réservoir qui accélère la méthylation du mercure. Parce qu'il semble exister un apport continu et à long terme de mercure et de matières organiques provenant de l'érosion des rives, on prévoit que la concentration de mercure chez le grand brochet et le doré demeurera élevée durant de nombreuses années dans la plupart des sites. Les résultats montrent la nécessité de procéder à un échantillonnage à long terme pour comprendre les tendances observées, et montre aussi l'importance de procéder à des échantillonnages à plus d'une station sur les plans d'eau de grande envergure.

Mots-clés: mercure; grand corégone; grand brochet, doré; cisco; poissons d'eau douce; réservoir; dérivation d'un fleuve; création d'un réservoir.

INTRODUCTION

It is now well accepted that mercury contamination problems can arise as a result of reservoir formation and without anthropogenic sources (Meister et al. 1979; Phillips 1980; Abernathy et al. 1985; Leskinen et al. 1986). Elevated fish mercury levels in reservoirs have been documented around the world and the source appears to be the flooded soil (Abernathy and Cumbie 1977; Cox et al. 1979). Most of the mercury accumulated by biota is methylmercury (Phillips 1980), which is produced by bacteria methylating mercury at the sediment surface. In reservoirs, much of this methylation takes place in the flooded zones, where the methylation/demethylation (M/D) ratios were higher than at offshore sites (Ramsey and Ramlal 1987b). Various conditions in the reservoir, including temperature, pH, accumulation of organic matter and aerobic bottom waters have been suggested as important to the methylation process (Phillips 1980; Hecky et al. 1986). These factors can increase the M/D ratio, resulting in more methylmercury available for uptake by the biota (Ramsey and Ramlal 1987b).

Fish can accumulate mercury passively through the gills or actively by feeding (Phillips and Buhler 1978; Boudou et al. 1979). Piscivorous fish usually have the highest mercury concentrations and this has been attributed to biomagnification through the food chain (Cox et al. 1979; Phillips et al. 1980; Potter et al. 1975; Wren and MacCrimmon 1985). Mercury levels of fish in temperate reservoirs have been shown to peak soon after impoundment and have been expected to decline within a few years (Abernathy and Cumbie 1977; Meister et al. 1979). However, mercury concentrations in pike and walleye from Southern Indian Lake and Issett Lake in northern Manitoba were still elevated 10 years after impoundment in 1986 (Bodaly et al. 1987a).

The objectives of this report are to update the data set presented in Bodaly et al. (1988) with two additional years of sampling (1987 and 1988), and to examine trends and site-to-site differences in fish mercury concentrations over the entire period of study (1975-88).

MATERIALS AND METHODS

STUDY AREA

Southern Indian Lake (SIL) is located in northern Manitoba on the Churchill River, which flows into the southwestern part of the lake and exits near the northern end. This natural flow of the Churchill through much of the lake was altered in 1976, when Manitoba Hydro completed construction of a control structure at the Missi Falls outlet and a diversion channel from South Bay to Issett Lake (Fig. 1). As a result, approximately 75% of the Churchill River flow was diverted into the headwaters of the Rat River system at Issett Lake. This diverted Churchill River water eventually enters the Nelson River at Split Lake.

As a result of impoundment, the water level of Southern Indian Lake rose by approximately 3 m above the long-term mean and the lake area increased by about 20%. The combined effect of the diversion of the Churchill River and construction of the Notigi control structure downstream caused Issett Lake water levels to rise by more than 7 m, resulting in flooding that was much more extensive than on SIL (Newbury et al. 1984).

SAMPLING

Fish were collected with gill nets from five regions of Southern Indian Lake and from Issett Lake. The regions of SIL sampled were South Bay (Area 6), the Channel, Camp 9 (Area 2), Area 4 and Area 5 (Fig. 1). Species sampled for mercury analysis were lake whitefish (Coregonus clupeaformis), northern pike (Esox lucius), walleye (Stizostedion vitreum), cisco (Coregonus artedii and Coregonus zenithicus), longnose sucker (Catostomus catostomus) and burbot (Lota lota). The gill net meshes normally used were 1 1/2", 2", 2 3/4", 3 1/2", 4 1/4" and 5 1/4" stretched measure, although sometimes only the three largest mesh sizes were fished. Commercial nets used on SIL are 5 1/4" stretched measure.

Whitefish sampling began in 1975, one year before impoundment of SIL. Northern pike and walleye were collected at a few sites in 1978 and at all sites by 1979. Cisco, longnose sucker and burbot were sampled initially in 1982.

Some sites were sampled more frequently than others during the study. Area 4 was considered an especially important site since it was the region of greatest commercial fishing activity. South Bay was fished regularly because of its close proximity to the SIL field camp. The Channel was sampled early in the study because the community of South Indian Lake is located there and residents regularly fished the area for their personal consumption. The Camp 9 site is in the region of a commercial fishing camp. Area 5 was not sampled often early in the study, but became more important as commercial fishing activity shifted northward into the region from Area 4 (Bodaly et al. 1984). There has also been commercial fishing on Issett Lake.

For each fish, fork length and round weight were recorded and a muscle sample was removed from the left caudal peduncle region. Samples were either frozen immediately or placed on ice and frozen within a few days. Early in the study, fish were frozen whole and sampled in the lab in Winnipeg. Mercury analyses followed the procedure described by Hendzel and Jamieson (1976).

CALCULATION OF MEANS

Where sample sizes were sufficient, mean mercury levels were calculated as (1) arithmetic means, (2) standardized means, and (3) adjusted means. Standardized means were calculated from log fork length-log mercury concentration linear regressions for each sample and the interpolation of mercury concentrations to a pre-determined fork length for each species. The pre-determined fork lengths (350 mm for whitefish, 550 mm for northern pike, 400 mm for walleye and 300 mm for cisco) were chosen as representative of these species in northern Manitoba because they approximate the grand means for the region. The grand mean fork lengths for the SIL and Issett Lake sites from our data were 371 mm for whitefish, 562 mm for pike, 389 mm for walleye, and 309 mm for cisco. Adjusted mean mercury concentrations were determined by analysis of covariance, where log mercury concentration was adjusted by the covariate, log fork length. Adjusted means were not calculated for longnose sucker, burbot and Area 4 walleye due to small sample sizes.

Results and discussion in this report will concentrate on whitefish, pike and walleye, species for which the most data are available.

RESULTS

Analyses and discussion in this report include all data from 1975 to 1988. Data from 1975 to 1986 are presented in Bodaly et al. (1988). Sample sizes for the entire study are shown in Table 1. Statistics for fish caught in 1987 and 1988 are given in Tables 2-7, while raw data for these fish may be found in Tables A1.1-A1.6. Mean mercury concentrations for the six fish species sampled over the period 1975-1988 are given in Tables 8-13.

Mean mercury concentrations were highest in pike and walleye, followed by burbot, cisco, whitefish and longnose sucker (Fig. 2). Because mercury concentration increases with fish size, arithmetic means were adjusted in two ways as described above (Fig. 3). Subsequent comparisons of mean mercury concentrations will use means standardized by linear regression, calculated for whitefish, pike, walleye and cisco. The effect of adjusting for fish size on mercury concentration can be seen by comparing arithmetic means with standardized and adjusted means (Table 8; Fig. 3). In general, year-to-year variability was reduced using these procedures.

Mercury concentrations of whitefish, pike and walleye increased following impoundment. Before impoundment, standardized mean mercury concentrations in lake whitefish ranged from 0.05 μg/g to 0.07 μg/g at SIL sites, whereas Issett Lake fish averaged 0.14 μg/g (Table 8; Fig. 4). After flooding, whitefish mean mercury concentrations in SIL reached levels

3.5X pre-flooding means. At SIL sites, maximums in our data ranged from 0.09 μg/g at Camp 9 to 0.26 μg/g in Area 5. Issett Lake whitefish mercury concentrations nearly doubled from 1975 to 1978. The highest standardized mean mercury concentration was 0.26 μg/g, found in Area 5 fish caught in 1981. Individual whitefish mercury concentrations ranged from <0.01 to 0.89 μg/g (Table 37 in Bodaly et al 1988; Table 2 this report). At most sites, whitefish mercury levels have declined steadily to near 1975 means. An exception was Area 5 whitefish sampled in 1988, which had mercury concentrations that were double those in fish sampled before impoundment.

Northern pike mean mercury concentrations were much higher than those of lake whitefish (Fig. 2). Although we did not collect pike before impoundment, commercial fishing data from SIL showed mean mercury levels from this period to range from 0.26 - 0.32 μg/g (Bodaly et al. 1984), as illustrated in Fig. 5. It should be noted that these means from commercial data are not adjusted for size and are probably high estimates for the population because they are derived from large fish. Standardized means for all sites rose significantly after flooding and were variable among sites and years, ranging from 0.54 μg/g - 1.09 μg/g over the period 1978-1988. Mercury concentrations of individual pike ranged from 0.05 μg/g to 2.67 μg/g over the course of the study (Table 3, this report and Table 38 in Bodaly et al. 1988). Mean mercury concentrations in pike did not appear to be decreasing 12 years after the impoundment of SIL and year-to-year variability was high. Adjusting for fish size seemed to reduce this year-to-year variability somewhat by increasing some means (e.g. Area 5, 1984) and decreasing others (e.g. Issett Lake, 1988) (Table 9; Fig. 5).

Walleye mercury concentrations were much higher than lake whitefish and usually slightly lower than pike (Fig. 2). Mean mercury concentrations from pre-impoundment commercial samples ranged from 0.19 μg/g to 0.30 μg/g. In our data, maximum standardized mean mercury concentrations for walleye varied from 0.51 (Camp 9, 1979) to 1.52 μg/g (Issett L., 1978) (Fig. 6). Actual maximums may have occurred in 1977, when no fish were sampled. Overall, the highest concentrations were found in Issett Lake fish. Mercury levels for individual walleye ranged from 0.06 μg/g to 2.88 μg/g (Table 4, this report and Table 39 in Bodaly et al. 1988). Walleye mercury levels for Camp 9 and Area 4 fish appear to have declined from maximum levels, while no such trend is apparent for other sites. The 1978 Issett Lake mean was calculated from a sample of only 5 fish and may not represent the population. Year-to-year variability of means was high at most sites, especially Issett Lake. Adjusting for size reduced some of this variability (Table 10; Fig. 3).

Cisco mercury concentrations were highest at Issett Lake and year-to-year variability was low, before and after adjusting for size (Table 11; Figs. 2,7). Longnose sucker mean mercury concentrations were often lower than those of lake whitefish and year-to-year variability was low (Table 12; Fig. 2). Burbot mercury levels were intermediate amongst the six fish species sampled (Table 13; Fig. 2).

Fish did not accumulate mercury equally at all sites. Overall, Issett Lake fish were highest in mercury and were highly variable from one year to the next (Figs. 4-7). Area 5 and South Bay fish were usually next highest in mercury and still quite variable year-to-year. Consistently lower in mercury and much less variable were fish caught at the Channel, Camp 9 and Area 4 sites on SIL.

Analyses of variance and covariance indicate highly significant year-to-year differences in both arithmetic and adjusted mean mercury concentrations for all species (Table 14). This was the case for whitefish even when 1975 (pre-impoundment) data were removed from the analyses. Some F statistics for cisco and walleye were significant only at the 5% level or were non-significant.

DISCUSSION

The significant post-impoundment increases observed in fish mercury concentrations in Southern Indian Lake and Issett Lake have been reported for most new reservoirs and the source is believed to be

flooded soil (Meister et al. 1979; Lodenius et al. 1982; Abernathy et al. 1985; Leskinen et al. 1986). The soils surrounding SIL and Issett Lake have low mercury concentrations (Bodaly et al. 1987b), so it would appear that high mercury concentrations in the flooded soils of a reservoir are not necessary to cause elevated fish mercury levels. In Lake Powell, mercury concentrations were low in soil, sediment, water, plant debris, algae and crayfish, while concentrations in fish were high (Potter et al. 1975). The critical factor for elevated mercury levels appears to be the presence of organic material in the reservoir. Yellow perch, held in limnocorrals in SIL, had higher mercury concentrations in the enclosures with added moss, spruce boughs and prairie sod (Hecky et al. 1986). Ramsey and Ramlal (1987a) found that methylation/demethylation ratios were higher in flooded zones than at offshore sites in northern Manitoba reservoirs. These flooded zones typically have bottoms consisting of terrestrial vegetation (moss, sedge, etc.) or similar materials deposited from the eroding shoreline.

The differences in mercury concentrations among fish species are likely related to differences in habitat utilization and feeding patterns. Fish can accumulate mercury passively from the water column across the gill membrane or actively by feeding. These two pathways of mercury accumulation are thought to be independant and additive (Phillips and Buhler 1978). Passive accumulation would be highest in littoral species such as pike that spend most of their time onshore, where methylation rates are highest. This may explain why pike are usually higher in mercury than walleye, which spend more time offshore. The piscivores, pike, walleye and burbot, accumulate more mercury actively than cisco, whitefish and longnose sucker because their main food supply (fish) is much higher in mercury than invertebrates, zooplankton and detritus (Surma-Aho et al. 1986; Potter et al. 1975).

Abernathy and Cumbie (1977) expected that elevated fish mercury levels in new reservoirs to decline 3 to 5 years after reservoir filling. Such a decline in mean mercury concentrations did occur for lake whitefish in SIL and Issett Lake, but not for pike and walleye. Walleye mercury concentrations have declined from recorded maximums at two SIL sites, but were relatively stable overall. Meister et al. (1979) and Cox et al. (1979) felt that fish mercury concentrations would decline over time due to depletion of mercury from the soils of the reservoir. However, unflooded soils and intact (non-eroded) flooded soils in the Churchill River Diversion were found to have very similar total mercury concentrations 6 years after flooding (Bodaly et al. 1987b). Newbury and McCullough (1984) estimated that the minimum period of restabilization for 75% of SIL shorelines would be 35 years, so we expect that organic material and mercury will be input to the reservoir for decades. Therefore, considering that rates of methylation remained high in SIL ten years after impoundment (Ramsey and Ramlal 1987a) and that fish eliminate mercury very slowly, we expect pike and walleye mercury levels to remain elevated for many years to come.

Three sites, Issett Lake, Area 5 and South Bay were consistently higher in fish mercury concentrations than others over the period of this study. Issett Lake has been flooded more extensively than any other site and has the highest mercury levels. The amount of terrestrial flooding has been shown to affect mercury concentrations in both small fish (Bodaly et al. 1987b) and large fish (Derksen and Green 1986). Area 5 is the most extensively flooded region of SIL (Newbury and McCullough 1984) and is the region of SIL most similar to Issett Lake. Much of the flooded habitat of both sites consists of gently sloped land covered predominantly by sphagnum, feather mosses, willow, alder, Labrador tea and black spruce. Two small lakes, formerly outside SIL, have been joined to Area 5 as a result of flooding, as were a few small lakes and associated lowland to Issett Lake. The similarity of these two sites especially in terms of flooded organic matter, may explain the similarity in fish mercury concentrations.

The high fish mercury levels in South Bay are more difficult to explain. Long fetches and relatively steep clay shorelines have resulted in high erosion rates in South Bay, introducing large quantities of organic material and mercury into the water column. This is especially true after storms, creating conditions that promote mercury methylation. Limnocorral

experiments by Hecky et al. (1986) showed that bank clay could stimulate mercury uptake by yellow perch. If South Bay fish mercury values are high due to clay bank erosion, it is difficult to understand why fish caught in other areas of SIL with similar erosion (eg. Camp 9) are consistently lower in mercury. It may be that other conditions in South Bay have increased the methylation/ demethylation ratio.

Conditions outside South Bay may also have influenced the mercury concentrations of fish there. Extensive flooding upstream of South Bay likely contributed to increased fish mercury concentrations (Johnston et al. 1991). It is also possible that there is now an exchange of fish between South Bay and Issett Lake through the diversion channel. Fish high in mercury may move from Issett Lake to South Bay.

Mercury levels were considerably lower in fish from the Channel, Camp 9 and Area 4. All three regions have higher suspended sediment loads since impoundment (Hecky and McCullough 1984). The Channel has a greatly increased flow, whereas the flow through the northern part of Area 2 (Camp 9) and Area 4 have been reduced by 75% as a result of diversion southward through the Channel (Newbury et al. 1984). These three regions are similar in that they don't include large areas of flooded moss, and shorelines tend to be steeper with more bedrock than in Area 5. There are clay shorelines much like South Bay, but other physical characteristics which may account for the differences in erosion rates and consequently the amount of mercury introduced into the lake. Area 4 has longer fetches than South Bay, which resulted in much higher erosion rates immediately after impoundment. And having been eroded back to bedrock, many shorelines are now more stable. Bank clay has been deposited largely in the deep open region of Area 4 rather than in shallow areas where most methylation occurs. Area 4 has the lowest shoreline to lake area ratio for any region in SIL (Newbury et al. 1984), which decreases the input of organic material and limits the prime habitat for methylating bacteria. Areas with high shoreline to lake area ratios tend to have more sheltered shallow back bays with intact flooded vegetation, locations where methylation rates are highest. Because the Channel and Camp 9 sites do not have the long fetches seen in Area 4 and South Bay, erosion rates are lower, and the input of organic material and mercury per unit of shoreline would be less.

The high year-to-year variability in fish mercury, as illustrated by the analyses of covariance (Table 14) confirms Phillips' (1980) contention that considerable year-to-year variability can occur long after impoundment of a reservoir. The methylation process, and ultimately mercury uptake by fish, are temperature dependent (Ramsey and Ramlal 1987b). Annual fluctuations in summer weather may cause variability in the amount of mercury accumulated by small forage fish, which could subsequently be reflected in mercury concentrations of piscivores. Since mercury concentration appears to be related to fish size, the year-to-year variability in mean mercury levels may also be attributable, at least in part, to variability in the size distribution of fish in each year's sample. Analyses of variance revealed significant annual differences in mean fork length for all sites and species (Table 14). The two adjustment procedures corrected mercury concentrations for size, but perhaps not completely.

The most significant aspect of this study is the quality of the data set over a long period of time. Whenever possible, at least 25 fish of each species were collected from every site. This allowed for long-term analyses of trends in fish mercury levels, within and among sites. Had sampling been terminated after five or six years, very different conclusions could have been drawn. This is especially true for pike and walleye mean mercury levels, where annual variability has been high. For example, Issett Lake walleye mercury levels appeared, by 1985, to be declining steadily. Data from 1986-1988 showed that there was no such trend, but rather high year-to-year variability.

Clearly, mercury levels in fish increased significantly as a direct result of the flooding of SIL and Issett Lake by Manitoba Hydro. Mercury concentration in fish was found to be affected by trophic status and size, as well as the site at which they were caught. The degree of flooding and the amount of organic material added to the lakes as a result of

erosion appear to be the most important reservoir conditions that stimulate the methylation of inorganic mercury. The large site-to-site differences in mean mercury levels in Southern Indian Lake suggest that large lakes cannot be characterized by samples from only one region of the lake.

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Table 1. Sample sizes for all species, 1975–88.

Species	Year	Southern Indian Lake					Issett Lake
		South Bay	Channel	Camp 9	Area 4	Area 5	
Lake whitefish	1975	25	50	25	25	25	24
	1978	–	17	–	16	–	5
	1979	30	26	40	60	–	–
	1980	20	24	28	27	–	–
	1981	26	25	24	67	25	–
	1982	37	31	25	25	24	25
	1983	28	34	26	24	–	24
	1984	38	–	46	47	50	47
	1985	50	44	–	25	–	50
	1986	50	–	39	51	–	54
	1987	44	–	–	58	50	43
	1988	50	–	50	50	50	50
Northern pike	1978	15	–	–	–	–	5
	1979	60	35	35	54	40	–
	1980	34	38	31	28	–	–
	1981	25	25	24	25	25	–
	1982	28	25	24	24	24	26
	1983	23	36	25	–	–	35
	1984	23	–	46	25	31	27
	1985	50	44	–	46	3	50
	1986	31	101	24	36	–	32
	1987	25	–	–	20	15	21
	1988	25	–	25	25	26	25
Walleye	1978	15	–	–	–	–	5
	1979	51	30	11	3	24	–
	1980	28	33	14	4	–	–
	1981	26	32	5	20	25	–
	1982	25	24	25	–	24	25
	1983	36	25	21	–	–	33
	1984	25	–	25	25	26	23
	1985	50	50	–	–	14	12
	1986	4	–	27	–	–	9
	1987	6	–		4	22	25
	1988	25	–	24	2	25	25
Cisco	1982	25	26	11	24	24	24
	1983	36	27	24	–	–	24
	1984	32	–	50	21	18	25
	1985	–	–	–	–	–	50
	1986	26	–	25	36	–	36
	1987	25	–	–	25	10	18
	1988	25	–	25	25	25	25
Longnose sucker	1982	7	24	25	24	24	4
	1983	–	16	25	–	–	–
	1984	1	–	41	25	5	–
	1985	–	–	–	–	–	–
	1986	17	–	34	36	–	–
	1987	5	–	–	25	25	7
	1988	25	–	25	25	25	15
Burbot	1982	–	4	–	24	–	–
	1983	–	–	5	–	–	–
	1984	1	–	12	2	6	–
	1985	–	–	–	–	–	–
	1986	13	–	14	22	–	15
	1987	1	–	–	13	5	2
	1988	14	–	25	25	25	5

Table 2. Mean fork lengths, round weights and muscle mercury concentrations of whitefish, 1987–88.

Site	Year	n	Fork length (mm)			Round weight (g)			Muscle [Hg] (μg/g)		
			mean	s.d.	range	mean	s.d.	range	mean	s.d.	range
South Bay	1987	43	390	45	323–517	977	446	505–2850	0.13	0.10	0.01–0.36
	1988	50	372	57	214–506	909	435	120–2345	0.09	0.06	0.01–0.22
Camp 9	1988	50	387	41	300–493	928	348	410–1945	0.09	0.05	0.01–0.34
Area 4	1987	56	368	53	244–483	746	344	100–1720	0.09	0.04	0.03–0.24
	1988	50	369	44	261–495	789	297	250–1755	0.08	0.02	0.04–0.14
Area 5	1987	50	406	33	345–488	1053	277	540–1700	0.13	0.08	0.06–0.55
	1988	50	411	30	321–471	1076	254	545–1710	0.18	0.07	0.08–0.39
Issett L.	1987	43	416	47	308–505	1233	448	450–2325	0.18	0.12	0.02–0.52
	1988	50	413	58	299–560	1282	687	430–4690	0.17	0.13	0.02–0.52

Table 3. Mean fork lengths, round weights and muscle mercury concentrations of northern pike, 1987–88.

Site	Year	n	Fork length (mm)			Round weight (g)			Muscle [Hg] (μg/g)		
			mean	s.d.	range	mean	s.d.	range	mean	s.d.	range
South Bay	1987	25	571	71	441–760	1275	556	500–2675	0.75	0.31	0.08–1.27
	1988	25	546	86	438–833	1244	891	495–4810	0.66	0.32	0.33–1.35
Camp 9	1988	25	555	49	474–645	1105	291	660–1645	0.73	0.24	0.29–1.14
Area 4	1987	25	552	80	406–750	1211	584	475–3025	0.65	0.20	0.25–0.99
	1988	20	585	66	471–730	1393	491	745–2590	0.76	0.16	0.37–1.04
Area 5	1987	15	564	43	480–620	1254	295	850–1835	0.68	0.19	0.36–0.99
	1988	26	588	67	481–815	1435	634	780–4200	0.84	0.30	0.45–1.93
Issett L.	1987	21	629	134	377–921	2151	1639	375–6450	0.81	0.34	0.28–1.84
	1988	25	619	181	292–922	2203	1868	165–6195	0.97	0.60	0.15–2.67

Table 4. Mean fork lengths, round weights and muscle mercury concentrations of walleye, 1987–88.

Site	Year	n	Fork length (mm)			Round weight (g)			Muscle [Hg] (μg/g)		
			mean	s.d.	range	mean	s.d.	range	mean	s.d.	range
South Bay	1987	6	373	76	220–428	827	590	100–1890	0.65	0.34	0.38–1.28
	1988	25	395	62	258–560	749	362	200–1790	0.76	0.64	0.27–2.88
Camp 9	1988	24	386	45	314–468	669	247	310–1145	0.33	0.08	0.20–0.59
Area 4	1987	4	398	32	367–442	725	275	475–1100	0.36	0.07	0.26–0.43
	1988	2	-	-	371–431	-	-	600- 940	-	-	0.41–0.58
Area 5	1987	22	400	65	246–535	847	410	145–1840	0.56	0.19	0.24–1.04
	1988	25	427	46	306–490	929	256	305–1345	0.60	0.25	0.28–1.13
Issett L.	1987	25	384	48	291–533	689	296	275–1775	0.68	0.43	0.33–1.97
	1988	25	404	70	239–532	826	379	150–1790	0.96	0.57	0.19–2.23

Table 5. Mean fork lengths, round weights and muscle mercury concentrations of cisco, 1987–88.

Site	Year	n	Fork length (mm)			Round weight (g)			Muscle [Hg] (μg/g)		
			mean	s.d.	range	mean	s.d.	range	mean	s.d.	range
South Bay	1987	25	321	34	271–410	515	271	290–1345	0.21	0.09	0.09–0.42
	1988	25	316	48	191–369	553	221	95- 815	0.21	0.08	0.08–0.35
Camp 9	1988	25	292	55	195–368	389	215	95- 815	0.18	0.08	0.07–0.41
Area 4	1987	25	326	29	240–375	483	133	150- 700	0.13	0.04	0.07–0.22
	1988	25	308	36	239–378	422	165	195- 755	0.16	0.06	0.04–0.27
Area 5	1987	10	315	59	178–358	531	232	55- 755	0.20	0.12	0.05–0.49
	1988	25	365	65	150–428	822	328	50–1495	0.24	0.09	0.08–0.50
Issett L.	1987	18	361	43	283–452	782	326	340–1510	0.31	0.15	0.12–0.72
	1988	25	346	42	248–422	733	283	200–1280	0.23	0.12	0.08–0.50

Table 6. Mean fork lengths, round weights and muscle mercury concentrations of longnose sucker, 1987–88.

Site	Year	n	Fork length (mm)			Round weight (g)			Muscle [Hg] (μg/g)		
			mean	s.d.	range	mean	s.d.	range	mean	s.d.	range
South Bay	1987	5	448	30	416–489	1331	217	1110–1645	0.13	0.03	0.09–0.17
	1988	25	443	53	330–553	1324	431	540–2010	0.12	0.08	0.03–0.41
Camp 9	1988	25	421	73	220–535	1217	508	135–2400	0.13	0.07	0.05–0.33
Area 4	1987	25	431	54	338–558	1206	388	600–2325	0.14	0.08	0.04–0.33
	1988	25	407	38	367–519	1041	300	710–2050	0.11	0.05	0.05–0.29
Area 5	1987	25	435	35	360–490	1188	263	795–1770	0.19	0.10	0.05–0.42
	1988	25	419	41	335–485	1045	266	500–1610	0.19	0.11	0.07–0.52
Issett L.	1987	11	429	35	378–488	1189	222	890–1650	0.13	0.06	0.04–0.27
	1988	15	404	64	220–476	1127	443	150–1960	0.11	0.07	0.01–0.24

Table 7. Mean fork lengths, round weights and muscle mercury concentrations of burbot, 1987–88.

Site	Year	n	Fork length (mm)			Round weight (g)			Muscle [Hg] (μg/g)		
			mean	s.d.	range	mean	s.d.	range	mean	s.d.	range
South Bay	1987	1	–	–	610	–	–	1300	–	–	0.40
	1988	14	554	74	436–693	1175	579	645–2650	0.33	0.19	0.15–0.82
Camp 9	1988	25	545	70	384–670	1079	348	340–1950	0.23	0.06	0.13–0.36
Area 4	1987	13	546	74	488–722	1017	483	630–2375	0.23	0.07	0.13–0.36
	1988	25	565	40	477–635	1109	223	490–1410	0.23	0.06	0.13–0.37
Area 5	1987	5	576	34	532–622	1084	296	660–1410	0.34	0.08	0.25–0.47
	1988	25	559	40	503–638	1141	226	850–1800	0.27	0.10	0.14–0.53
Issett L.	1987	2	–	–	515–640	–	–	960–1450	–	–	0.28–0.31
	1988	5	621	76	537–705	1743	696	1140–2620	0.32	0.13	0.13–0.45

Table 8. Mean muscle mercury concentrations (μg/g) of lake whitefish from Southern Indian Lake sites and Issett Lake, 1975–88. Data for 1975–86 is from Bodaly et al. (1988).

Year	Years after (before) impoundment	Southern Indian Lake					Issett Lake
		South Bay	Channel	Camp 9	Area 4	Area 5	
1. Arithmetic means:							
1975	(1)	0.07	0.06	0.05	0.05	0.07	0.15
1978	2	–	0.30	–	0.22	–	0.32
1979	3	0.31	0.25	0.13	0.10	–	–
1980	4	0.20	0.21	0.13	0.14	–	–
1981	5	0.14	0.20	0.10	0.08	0.26	–
1982	6	0.11	0.09	0.09	0.11	0.19	0.21
1983	7	0.15	0.15	0.09	0.05	–	0.17
1984	8	0.16	–	0.09	0.10	0.20	0.23
1985	9	0.09	0.15	–	0.12	–	0.25
1986	10	0.13	–	0.10	0.09	–	0.09
1987	11	0.13	–	–	0.09	0.13	0.18
1988	12	0.09	–	0.09	0.08	0.18	0.17
2. Means standardized by linear regression:							
1975	(1)	0.07	0.06	0.05	0.05	0.07	0.14
1978	2	–	0.15	–	0.21	–	0.24
1979	3	0.24	0.20	0.08	0.09	–	–
1980	4	0.17	0.18	0.09	0.13	–	–
1981	5	0.14	0.19	0.09	0.05	0.26	–
1982	6	0.09	0.07	0.06	0.09	0.16	0.19
1983	7	0.14	0.08	0.05	0.04	–	0.11
1984	8	0.12	–	0.09	0.08	0.16	0.14
1985	9	0.08	0.07	–	0.10	–	0.10
1986	10	0.11	–	0.08	0.07	–	0.06
1987	11	0.07	–	–	0.08	0.11	0.06
1988	12	0.06	–	0.07	0.07	0.14	0.07
3. Means adjusted by analysis of covariance:							
1975	(1)	0.08	0.05	0.05	0.06	0.06	0.17
1978	2	–	0.23	–	0.22	–	0.65
1979	3	0.24	0.24	0.10	0.09	–	–
1980	4	0.19	0.16	0.10	0.13	–	–
1981	5	0.12	0.18	0.09	0.07	0.24	–
1982	6	0.09	0.07	0.07	0.10	0.17	0.22
1983	7	0.14	0.10	0.07	0.04	–	0.15
1984	8	0.12	–	0.09	0.08	0.19	0.19
1985	9	0.08	0.10	–	0.11	–	0.17
1986	10	0.11	–	0.09	0.08	–	0.09
1987	11	0.08	–	–	0.08	0.11	0.13
1988	12	0.07	–	0.08	0.08	0.17	0.11

Table 9. Mean muscle mercury concentrations (μg/g) of northern pike from Southern Indian Lake sites and Issett Lake, 1978–88. Data for 1978–86 is from Bodaly et al. (1988).

Year	Years after impoundment	Southern Indian Lake					Issett Lake
		South Bay	Channel	Camp 9	Area 4	Area 5	
1. Arithmetic means:							
1978	2	0.77	–	–	–	–	0.61
1979	3	0.69	0.57	0.58	0.49	0.62	–
1980	4	0.78	0.57	0.61	0.63	–	–
1981	5	0.89	0.64	0.66	0.72	0.68	–
1982	6	0.96	0.77	0.68	0.63	0.79	0.90
1983	7	0.83	0.65	0.68	–	–	1.04
1984	8	1.18	–	0.57	0.63	0.50	1.09
1985	9	0.67	0.75	–	0.74	0.35	1.12
1986	10	0.86	–	0.80	0.68	–	0.90
1987	11	0.75	–	–	0.75	0.68	0.81
1988	12	0.66	–	0.73	0.76	0.92	0.97
2. Means standardized by linear regression:							
1978	2	0.61	–	–	–	–	0.54
1979	3	0.68	0.63	0.57	0.50	0.65	–
1980	4	0.75	0.57	0.60	0.63	–	–
1981	5	0.88	0.62	0.65	0.70	0.69	–
1982	6	0.92	0.77	0.65	0.61	0.75	0.76
1983	7	0.72	0.60	0.65	–	–	0.85
1984	8	1.09	–	0.69	0.61	0.61	0.86
1985	9	0.65	0.71	–	0.68	–	0.73
1986	10	0.77	0.65	0.75	0.60	–	0.69
1987	11	0.62	–	–	0.62	0.62	0.64
1988	12	0.62	–	0.68	0.68	0.69	0.69
3. Means adjusted by analysis of covariance:							
1978	2	0.54	–	–	–	–	0.69
1979	3	0.71	0.63	0.56	0.50	0.67	–
1980	4	0.76	0.49	0.58	0.64	–	–
1981	5	0.87	0.64	0.65	0.69	0.64	–
1982	6	0.92	0.71	0.59	0.58	0.68	0.93
1983	7	0.72	0.54	0.61	–	–	0.94
1984	8	1.08	–	0.61	0.67	0.51	1.06
1985	9	0.64	0.64	–	0.68	–	0.88
1986	10	0.78	0.61	0.72	0.60	–	0.86
1987	11	0.63	–	–	0.62	0.59	0.77
1988	12	0.61	–	0.68	0.69	0.68	0.87

Table 10. Mean muscle mercury concentrations (μg/g) of walleye from Southern Indian Lake sites and Issett Lake, 1978–88. Data for 1978–86 is from Bodaly et al. (1988).

Year	Years after impoundment	Southern Indian Lake					Issett Lake
		South Bay	Channel	Camp 9	Area 4	Area 5	
1. Arithmetic means:							
1978	2	0.80	–	–	–	–	1.52
1979	3	0.47	0.47	0.59	0.35	0.56	–
1980	4	0.59	0.56	0.53	0.57	–	–
1981	5	0.64	0.55	0.45	0.58	0.66	–
1982	6	0.78	0.45	0.47	–	0.70	0.79
1983	7	0.56	0.49	0.47	–	–	1.37
1984	8	0.65	–	0.40	0.45	0.58	0.46
1985	9	0.69	0.47	–	–	0.60	1.02
1986	10	0.50	–	0.38	–	–	1.37
1987	11	0.65	–	–	0.36	0.56	0.68
1988	12	0.76	–	0.33	0.50	0.60	0.96
2. Means standardized by linear regression:							
1978	2	0.75	–	–	–	–	1.52
1979	3	0.48	0.49	0.51	0.44	0.56	–
1980	4	0.65	0.54	0.49	0.61	–	–
1981	5	0.68	0.54	0.46	0.54	0.73	–
1982	6	0.58	0.42	0.47	–	0.66	1.02
1983	7	0.54	0.45	0.47	–	–	1.02
1984	8	0.63	–	0.40	0.42	0.59	0.77
1985	9	0.58	0.44	–	–	0.44	0.44
1986	10	0.51	–	0.36	–	–	1.13
1987	11	0.59	–	–	0.36	0.54	0.66
1988	12	0.65	–	0.33	–	0.48	0.81
3. Means adjusted by analysis of covariance:							
1978	2	0.68	–	–	–	–	1.41
1979	3	0.38	0.47	0.50	–	0.58	–
1980	4	0.57	0.51	0.52	–	–	–
1981	5	0.59	0.51	0.47	–	0.75	–
1982	6	0.72	0.41	0.45	–	0.62	0.72
1983	7	0.51	0.44	0.46	–	–	0.83
1984	8	0.60	–	0.38	–	0.56	0.74
1985	9	0.61	0.44	–	–	0.5	0.46
1986	10	0.47	–	0.35	–	–	0.99
1987	11	0.60	–	–	–	0.53	0.58
1988	12	0.60	–	0.32	–	0.51	0.71

Table 11. Mean muscle mercury concentrations (μg/g) of cisco from Southern Indian Lake sites and Issett Lake, 1982–88. Data for 1982–86 is from Bodaly et al. (1988).

Year	Years after impoundment	Southern Indian Lake					Issett Lake
		South Bay	Channel	Camp 9	Area 4	Area 5	
1. Arithmetic means:							
1982	6	0.18	0.16	0.30	0.18	0.18	0.45
1983	7	0.24	0.17	0.15	–	–	0.25
1984	8	0.22	–	0.19	0.13	0.19	0.35
1985	9	–	–	–	–	–	0.25
1986	10	0.21	–	0.18	0.13	–	0.23
1987	11	0.21	–	–	0.13	0.20	0.31
1988	12	0.21	–	0.18	0.16	0.24	0.23
2. Means standardized by linear regression:							
1982	6	0.19	–	0.21	0.16	0.15	0.20
1983	7	0.21	–	0.13	–	–	0.21
1984	8	0.20	–	0.18	0.13	0.21	0.27
1985	9	–	–	–	–	–	0.18
1986	10	0.19	–	0.16	0.12	–	0.16
1987	11	0.17	–	–	0.12	0.16	0.20
1988	12	0.18	–	0.18	0.17	0.18	0.13
3. Means adjusted by analysis of covariance:							
1982	6	0.22	–	0.23	0.15	0.15	0.36
1983	7	0.21	–	0.13	–	–	0.25
1984	8	0.20	–	0.17	0.13	0.25	0.32
1985	9	–	–	–	–	–	0.23
1986	10	0.18	–	0.15	0.12	–	0.22
1987	11	0.18	–	–	0.12	0.17	0.25
1988	12	0.19	–	0.17	0.17	0.19	0.19

Table 12. Mean muscle mercury concentrations (μg/g) of longnose sucker from Southern Indian Lake sites and Issett Lake, 1982–88. Data for 1982–86 is from Bodaly et al. (1988).

Year	Years after impoundment	Southern Indian Lake					Issett Lake
		South Bay	Channel	Camp 9	Area 4	Area 5	
1. Arithmetic means:							
1982	6	0.06	0.12	0.08	0.15	0.15	0.13
1983	7	–	0.07	0.08	–	–	–
1984	8	–	–	0.10	0.13	0.20	–
1985	9	–	–	–	–	–	–
1986	10	0.16	–	0.10	0.21	–	0.08
1987	11	0.13	–	–	0.14	0.19	0.13
1988	12	0.12	–	0.13	0.11	0.19	0.11

Table 13. Mean muscle mercury concentrations (μg/g) of burbot from Southern Indian Lake sites and Issett Lake, 1982–88. Data for 1982–86 is from Bodaly et al. (1988).

Year	Years after impoundment	Southern Indian Lake					Issett Lake
		South Bay	Channel	Camp 9	Area 4	Area 5	
1. Arithmetic means:							
1982	6	–	0.18	–	0.23	0.31	–
1983	7	–	–	0.18	–	–	–
1984	8	–	–	0.22	0.13	0.48	–
1985	9	–	–	–	–	–	–
1986	10	0.36	–	0.30	0.31	–	0.28
1987	11	–	–	–	0.23	0.34	–
1988	12	0.33	–	0.23	0.23	0.27	0.32

Table 14. Results of statistical analyses used to test for year-to-year differences in mean fork length, mean mercury concentration and adjusted mean mercury concentration (* indicates significance at $p<0.05$; ** indicates significance at $p<0.01$; ns indicates not significant, $p\geq0.05$).

Species	Site	Years compared												ANOVA		ANOCOVA
		75	78	79	80	81	82	83	84	85	86	87	88	Fork length	Mean [Hg]	Adjusted mean [Hg]
Lake whitefish	South Bay	x		x	x	x	x	x	x	x	x	x	x	**	**	**
				x	x	x	x	x	x	x	x	x	x	**	**	**
	Channel	x	x	x	x	x	x	x		x				**	**	**
			x	x	x	x	x	x		x				**	**	**
	Camp 9	x		x	x	x	x	x	x		x		x	**	**	**
				x	x	x	x	x	x		x		x	**	**	**
	Area 4	x	x	x	x	x	x	x	x	x	x	x	x	**	**	**
			x	x	x	x	x	x	x	x	x	x	x	**	**	**
	Area 5	x		x		x	x		x			x	x	**	**	**
				x		x	x		x			x	x	**	**	**
	Issett Lake	x					x	x	x	x	x	x	x	**	**	**
							x	x	x	x	x	x	x	**	**	**
Northern pike	South Bay		x	x	x	x	x	x	x	x	x	x	x	**	**	**
	Channel		x	x	x	x	x	x		x	x			**	**	**
	Camp 9			x	x	x	x	x	x		x		x	**	**	**
	Area 4		x	x	x	x	x		x	x	x	x	x	**	**	**
	Area 5			x		x	x		x			x	x	**	**	**
	Issett Lake			x			x	x	x	x	x	x	x	**	**	**
Walleye	South Bay		x	x	x	x	x	x	x	x	x	x	x	**	**	**
	Channel			x	x	x	x	x		x				**	ns	ns
	Camp 9			x	x	x	x	x	x		x		x	**	**	**
	Area 4			x	x	x			x			x	x	Insufficient data for analyses		
	Area 5			x		x	x		x			x	x	**	*	**
	Issett Lake		x				x	x	x	x	x	x	x	**	**	**
Cisco	South Bay						x	x	x		x	x	x	**	ns	ns
	Channel						x	x						Insufficient data for analyses		
	Camp 9						x	x	x		x		x	ns	**	**
	Area 4						x		x		x	x	x	**	*	*
	Area 5						x		x			x	x	**	ns	**
	Issett Lake						x	x	x	x	x	x	x	*	**	**
Longnose sucker	South Bay						x		x		x	x	x	Insufficient data for analyses		
	Channel						x	x						Insufficient data for analyses		
	Camp 9						x	x	x		x		x	ns	**	**
	Area 4						x		x		x	x	x	**	**	**
	Area 5						x		x			x	x	Insufficient data for analyses		
	Issett Lake						x				x	x	x	Insufficient data for analyses		

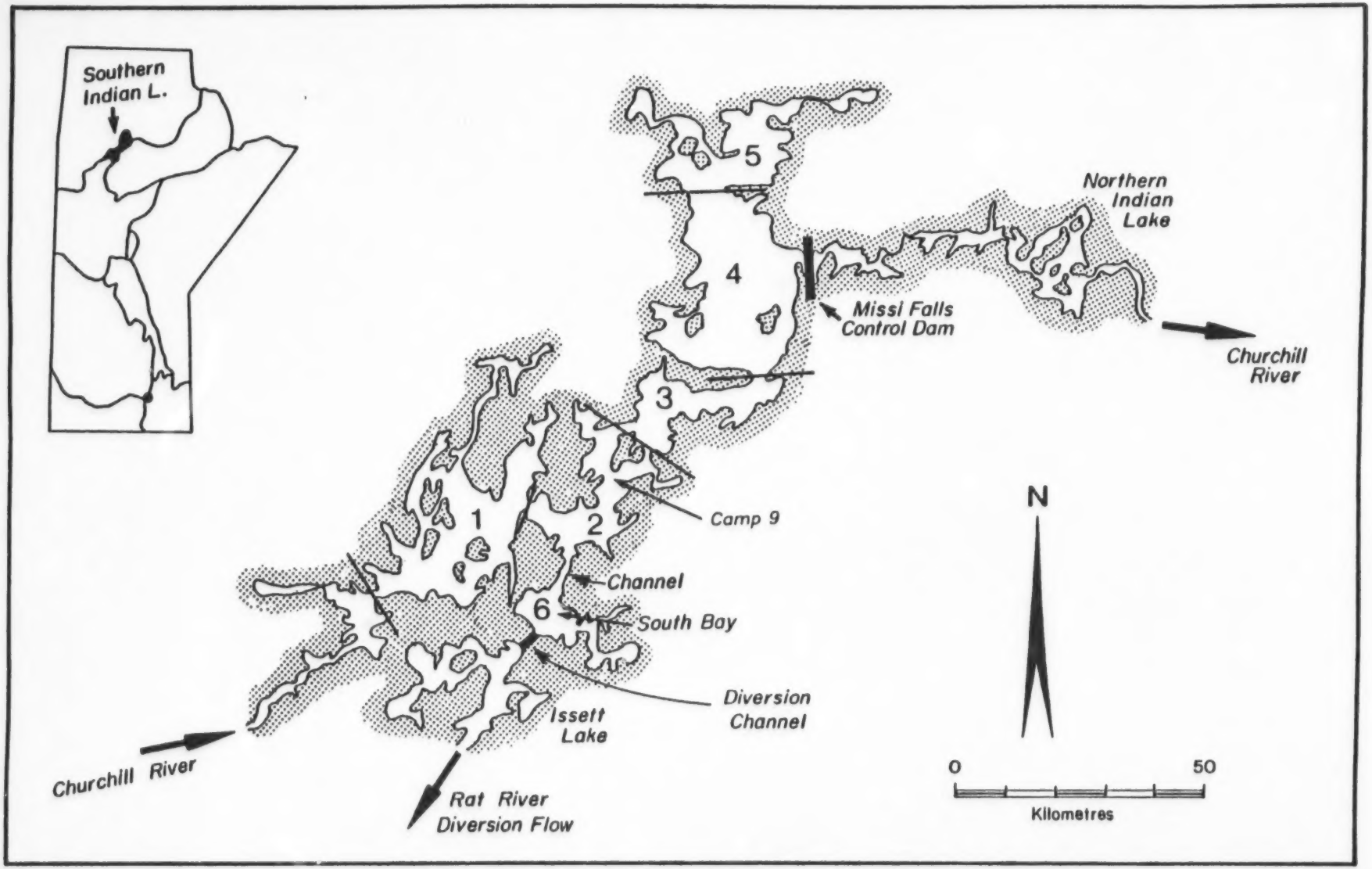

Fig. 1. Map of study area showing sampling sites.

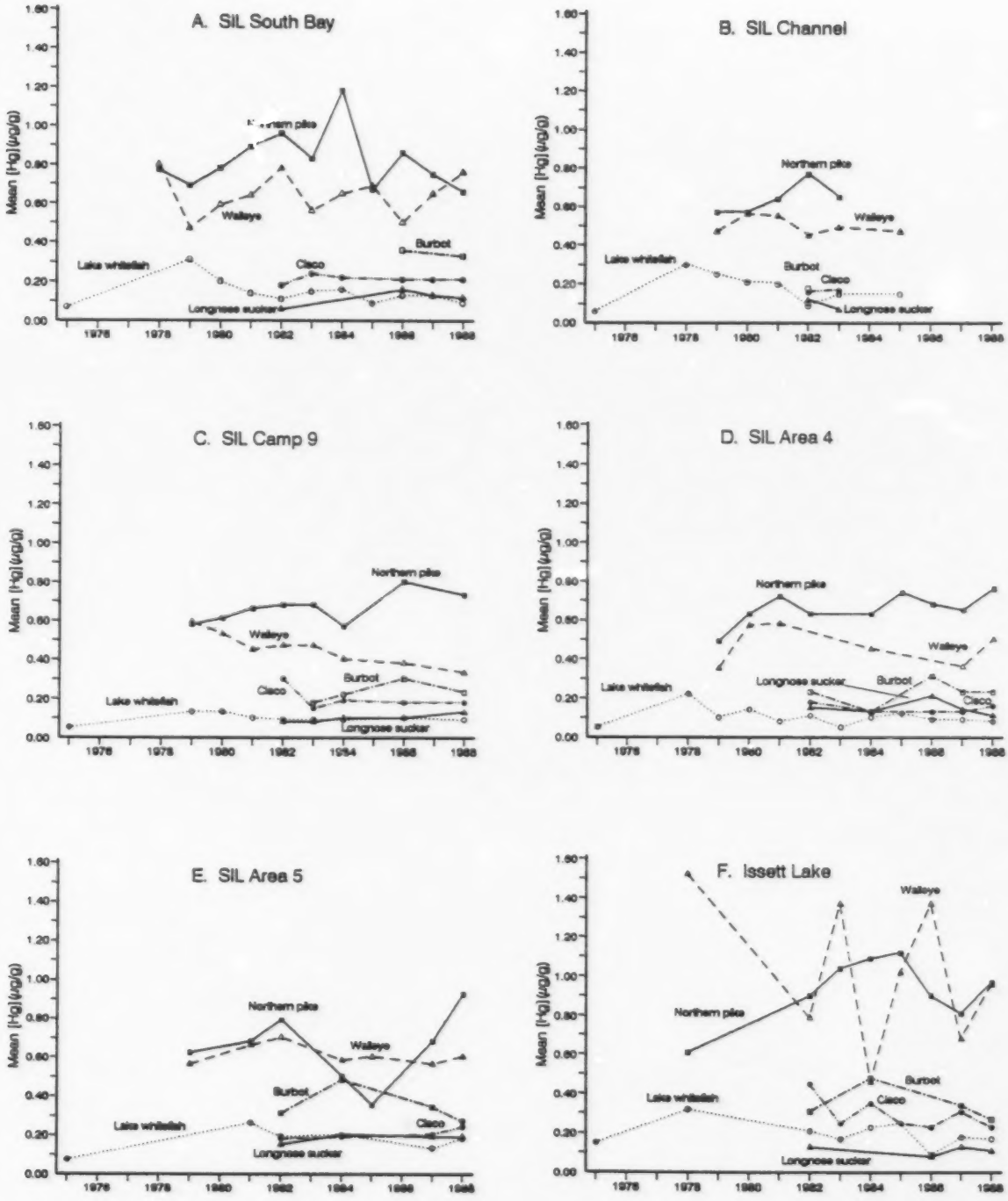

Fig. 2. Mean mercury concentrations of all species caught at each site from 1975 to 1988.

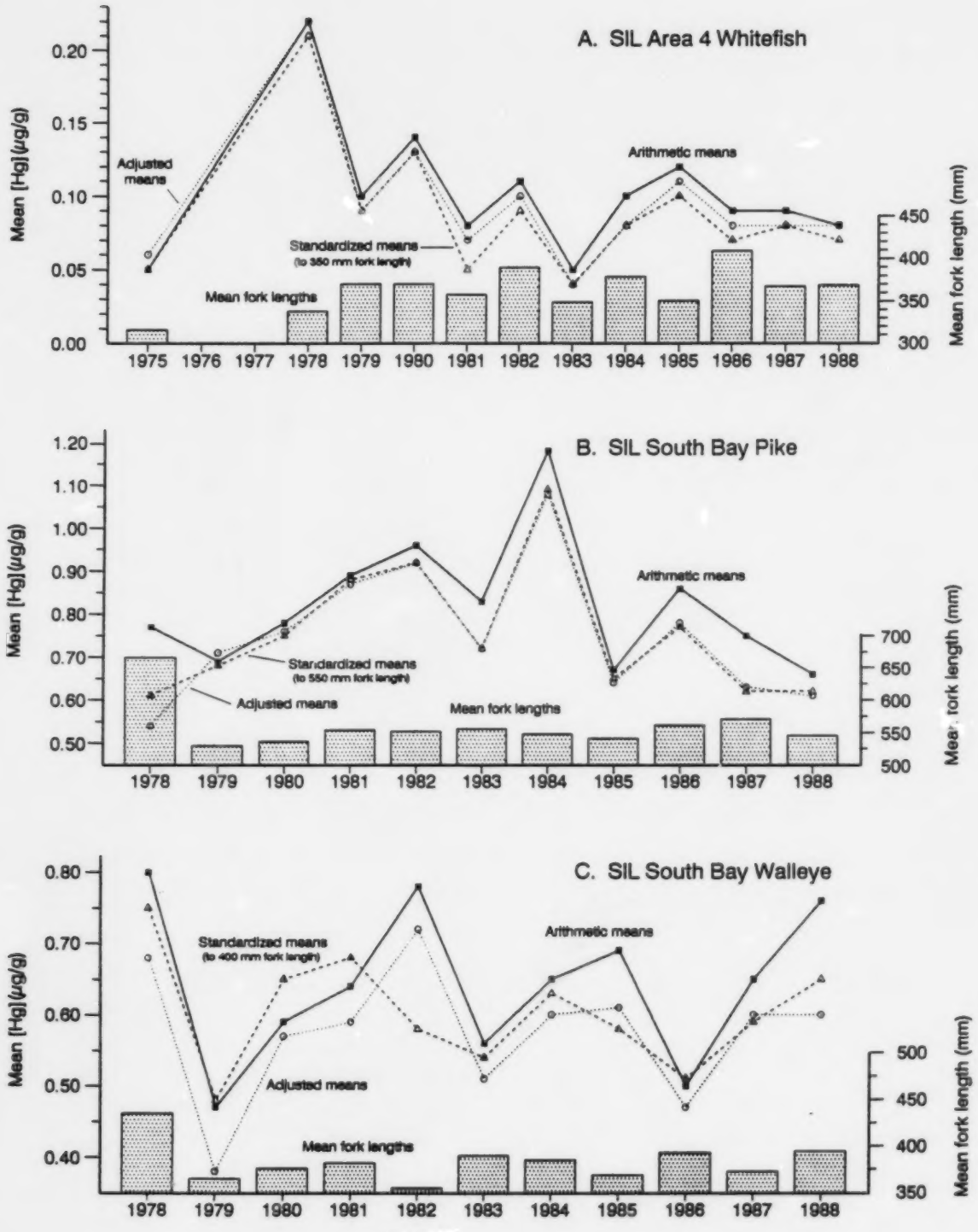

Fig. 3. Examples of the effect of standardizing and adjusting mercury concentration means for whitefish, northern pike and walleye.

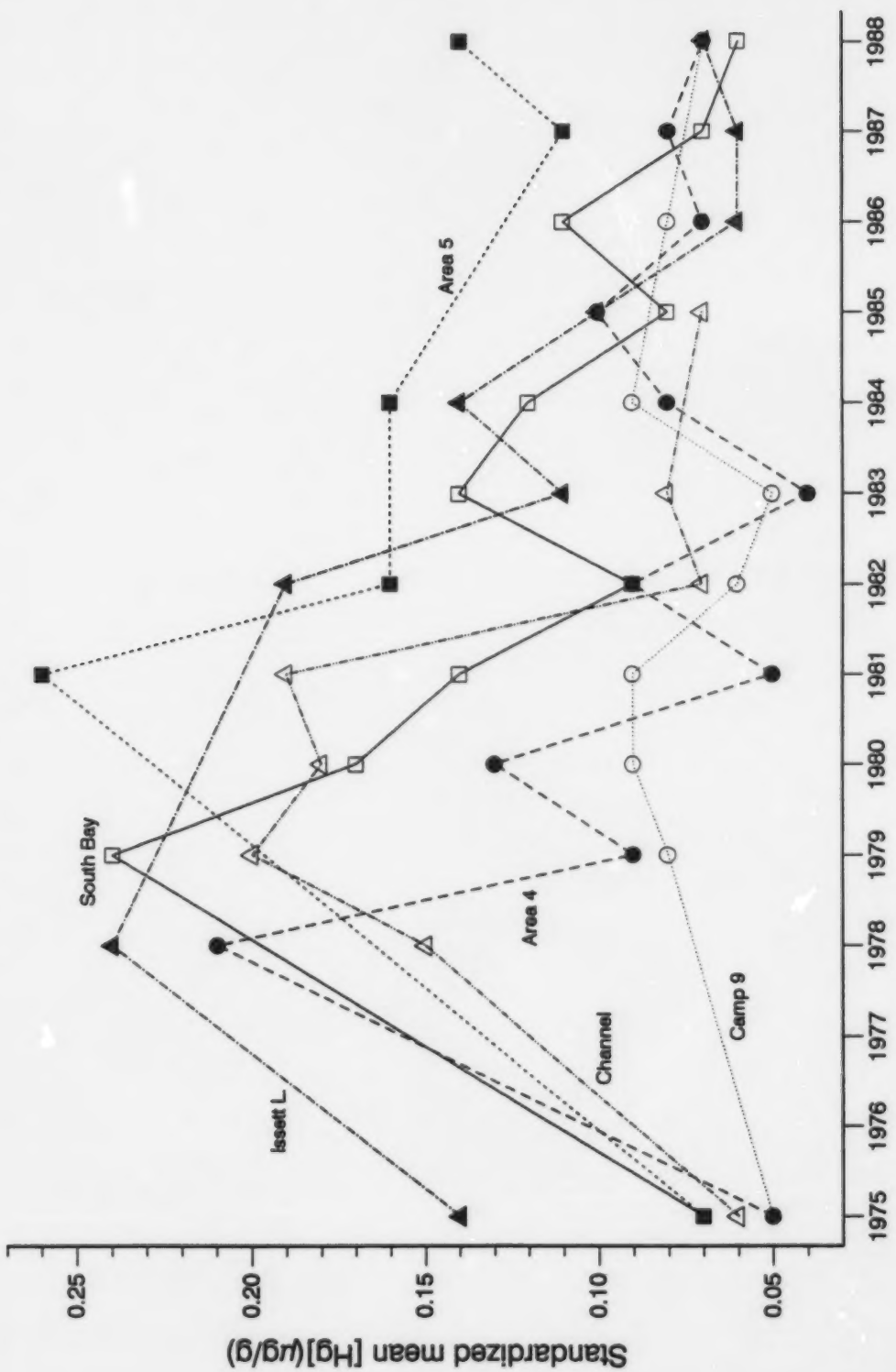

Fig. 4. Whitefish mean muscle mercury concentrations standardized by log fork length - log [Hg] linear regression to a fork length of 350 mm.

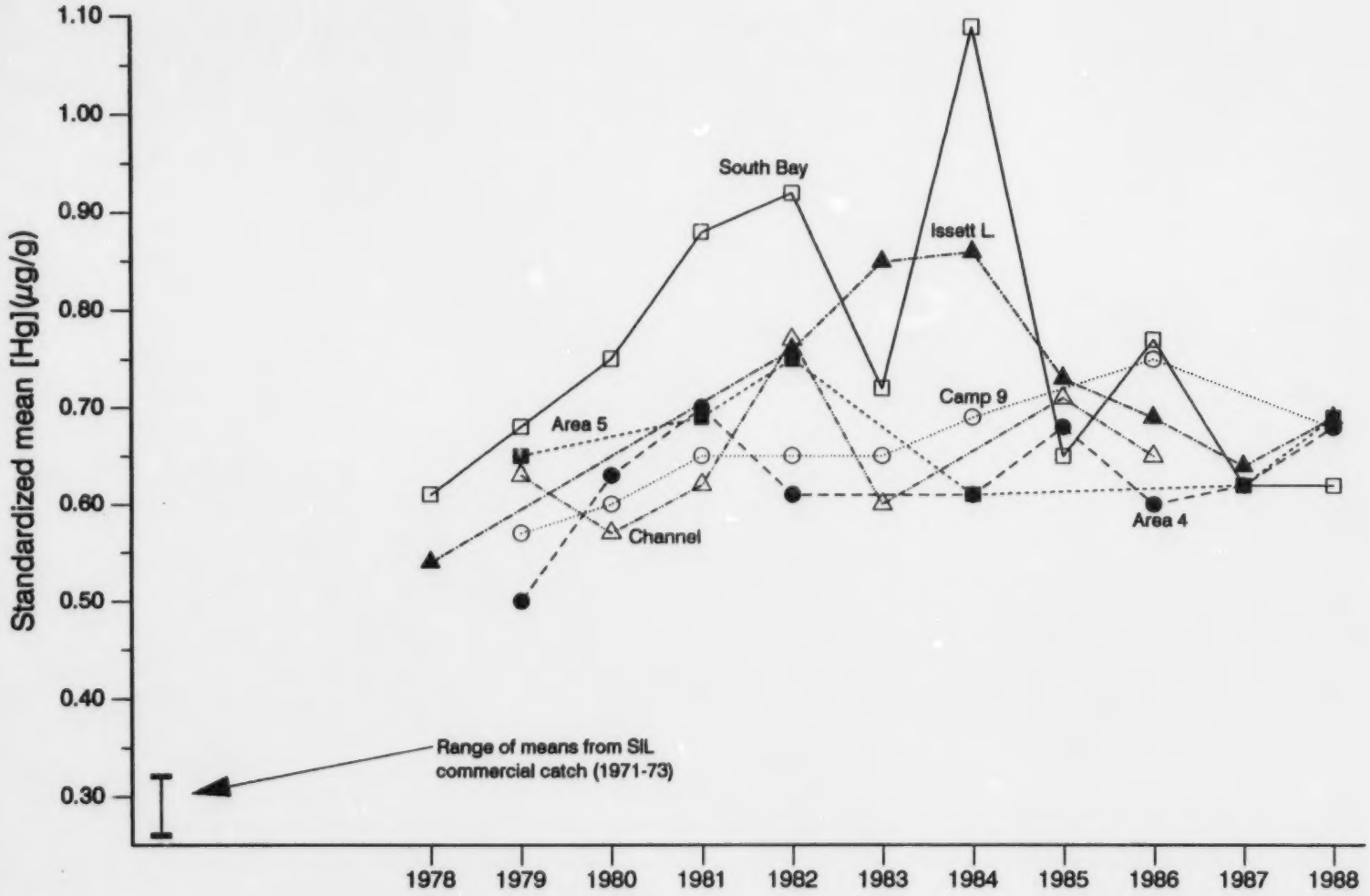

Fig. 5. Northern pike mean muscle mercury concentrations standardized by log fork length - log [Hg] linear regression to a fork length of 550 mm.

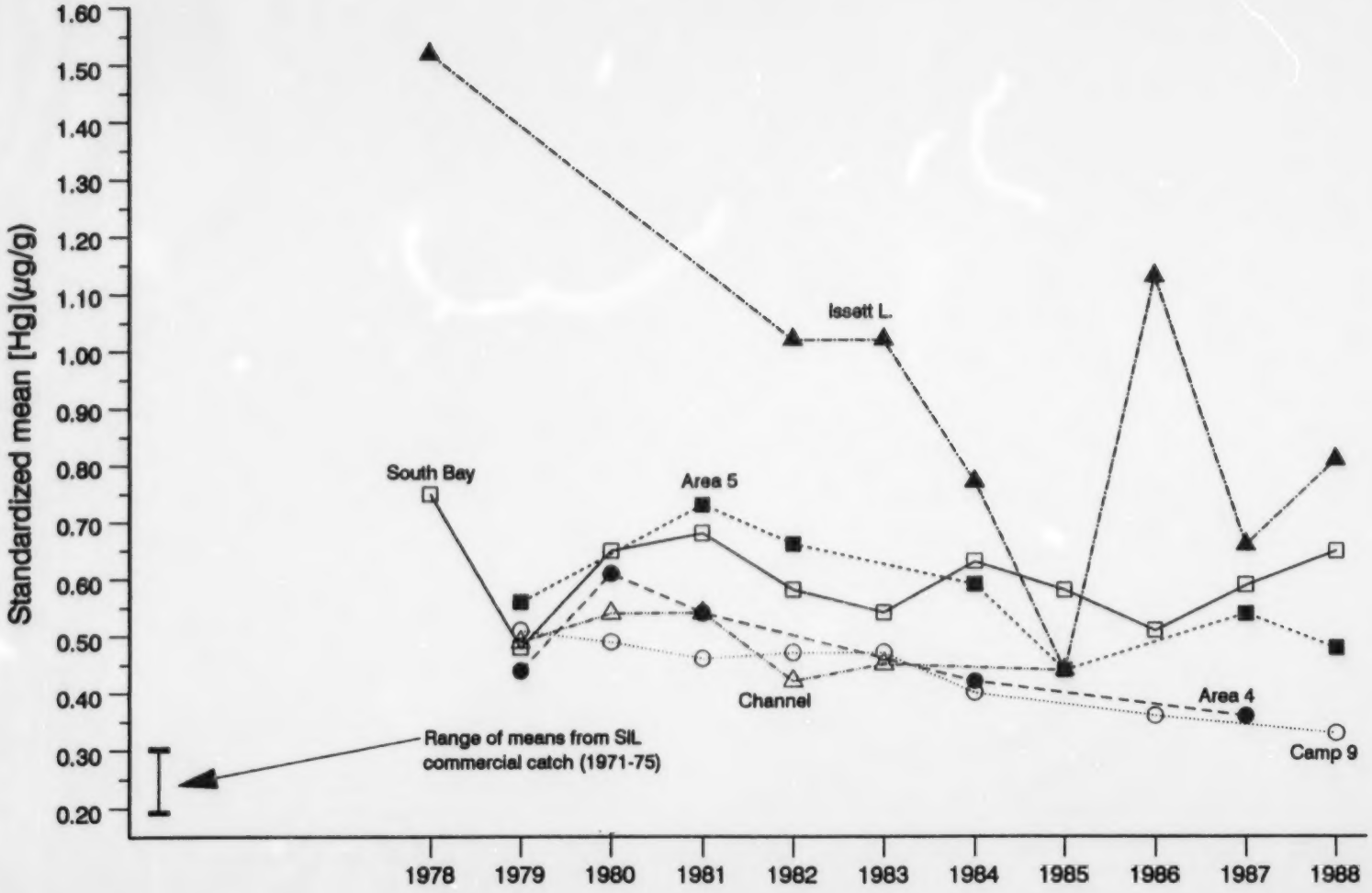

Fig. 6. Walleye mean muscle mercury concentrations standardized by log fork length - log [Hg] linear regression to a fork length of 400 mm.

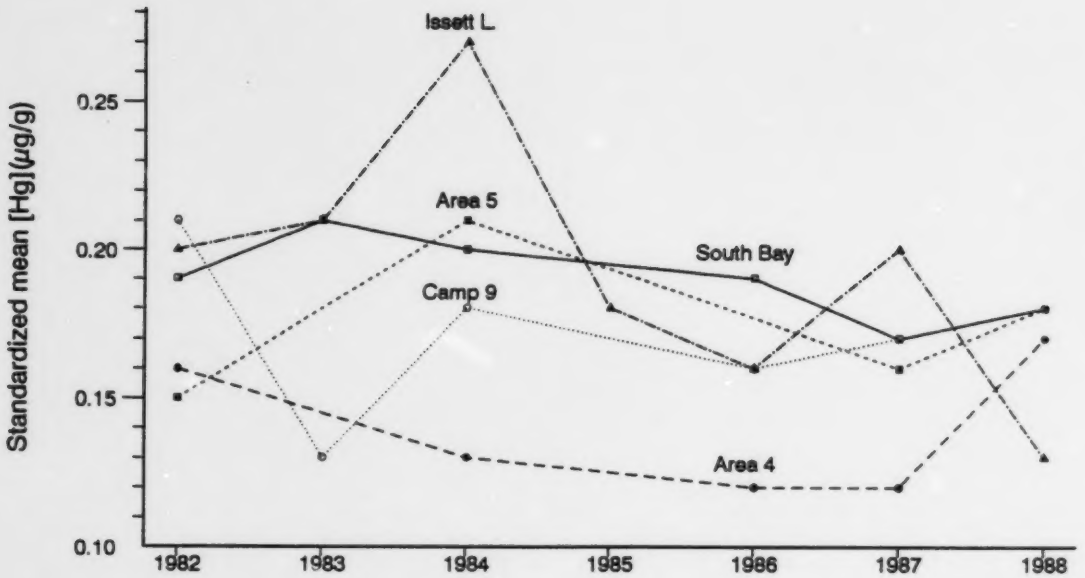

Fig. 7. Cisco mean muscle mercury concentrations standardized by log fork length - log [Hg] linear regression to a fork length of 300 mm.

Table A1.1. Fork lengths, round weights and muscle mercury concentrations of lake whitefish, 1987–88.

	South Bay						Camp 9			Area 4						Area 5						Isectt L.					
	1987			1988			1988			1987			1988			1987			1988			1987			1988		
Fish no	Fork length (mm)	Round weight (g)	Muscle [Hg] (µg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (µg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (µg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (µg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (µg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (µg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (µg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (µg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (µg/g)
1	334	550	0.09	350	660	0.13	300	410	0.01	392	825	0.10	347	655	0.06	425	1450	0.20	442	1355	0.12	400	1000	0.07	381	995	0.05
2	360	610	0.01	372	860	0.04	324	645	0.09	354	500	0.08	305	420	0.05	458	1560	0.22	401	1055	0.13	415	1250	0.21	388	980	0.02
3	356	760	0.01	395	890	0.12	384	750	0.08	310	400	0.03	352	645	0.09	422	1200	0.11	375	900	0.12	450	1500	0.17	379	970	0.41
4	375	760	0.04	360	700	0.14	342	505	0.06	282	300	0.08	421	1125	0.09	445	1150	0.19	425	1355	0.14	400	1160	0.06	424	1585	0.05
5	448	1280	0.15	428	1260	0.31	357	680	0.08	357	425	0.09	330	550	0.07	428	1110	0.15	425	1385	0.15	485	2110	0.31	376	920	0.30
6	355	700	0.07	382	880	0.15	378	755	0.14	324	350	0.08	265	250	0.05	382	840	0.27	430	1280	0.17	445	1420	0.50	345	745	0.04
7	408	1090	0.16	351	685	0.06	455	1310	0.07	385	775	0.07	358	665	0.07	385	750	0.08	375	855	0.11	402	1250	0.16	527	560	0.09
8	355	655	0.06	421	1150	0.06	408	1060	0.11	305	400	0.09	390	900	0.08	348	600	0.09	413	1280	0.14	365	740	0.18	533	615	0.08
9	325	580	0.08	315	500	0.07	382	650	0.08	264	200	0.08	335	610	0.07	358	680	0.08	471	1710	0.12	445	1520	0.20	533	565	0.08
10	375	840	0.06	322	560	0.12	326	505	0.06	295	350	0.09	355	550	0.05	400	1040	0.16	398	1000	0.12	448	1620	0.15	558	560	0.42
11	358	690	0.09	320	550	0.05	377	1795	0.09	298	375	0.09	420	1025	0.08	430	1300	0.14	321	545	0.08	460	1070	0.15	299	500	0.15
12	427	1155	0.10	417	1250	0.11	397	905	0.07	254	225	0.11	339	660	0.14	345	650	0.07	390	950	0.30	394	940	0.13	504	470	0.05
13	420	1175	0.16	444	1410	0.22	334	520	0.08	404	1000	0.08	326	525	0.12	425	1160	0.10	416	1295	0.14	388	850	0.10	442	1000	0.05
14	411	1150	0.15	420	1110	0.05	366	620	0.08	377	750	0.08	426	1110	0.15	405	980	0.11	395	995	0.12	465	1475	0.29	525	2695	0.41
15	408	1155	0.07	366	845	0.08	345	655	0.12	290	350	0.09	390	875	0.08	355	700	0.08	465	1450	0.14	422	1150	0.25	455	1520	0.16
16	388	830	0.17	350	780	0.09	430	1145	0.14	377	675	0.08	395	955	0.09	445	1445	0.17	386	795	0.25	420	1050	0.10	432	1565	0.21
17	384	1025	0.01	439	1430	0.21	374	750	0.08	406	1000	0.07	366	1755	0.06	352	540	0.09	344	560	0.08	438	1275	0.30	465	1750	0.18
18	308	2345	0.34	346	740	0.16	408	925	0.08	380	750	0.09	382	805	0.08	390	1060	0.16	455	1200	0.35	357	550	0.05	460	1700	0.30
19	435	1490	0.26	310	460	0.08	380	900	0.08	316	450	0.07	340	700	0.06	394	850	0.08	441	1200	0.15	421	1150	0.08	426	1245	0.28
20	412	1045	0.31	391	1125	0.08	385	760	0.08	424	1125	0.12	375	760	0.08	412	1000	0.23	405	1075	0.12	425	1250	0.34	386	980	0.21
21	355	800	0.06	420	1280	0.08	495	1600	0.12	380	775	0.10	355	660	0.09	353	700	0.07	372	795	0.12	408	1075	0.12	440	1480	0.09
22	350	800	0.13	410	1255	0.05	402	1000	0.08	412	925	0.08	395	940	0.09	385	890	0.07	450	1200	0.13	370	675	0.02	427	1340	0.16
23	356	525	0.05	410	1430	0.05	342	615	0.08	361	700	0.05	395	1110	0.11	455	1280	0.07	420	1170	0.50	572	850	0.02	395	960	0.05
24	448	1305	0.56	398	1065	0.08	438	1520	0.13	422	1150	0.14	354	650	0.06	415	1250	0.09	413	1150	0.21	423	1250	0.16	355	665	0.04
25	422	1080	0.18	335	560	0.07	380	860	0.11	380	850	0.11	400	975	0.08	555	610	0.07	414	990	0.36	360	800	0.07	560	4690	0.21
26	448	1400	0.36	395	1115	0.08	356	655	0.06	442	1175	0.15	370	695	0.06	356	640	0.07	388	815	0.32	455	1450	0.29	485	2010	0.50
27	517	2850	0.32	505	640	0.08	350	650	0.07	377	800	0.12	384	865	0.06	425	1160	0.12	409	1020	0.16	342	625	0.02	455	1500	0.19
28	373	695	0.13	315	405	0.09	402	1080	0.09	427	1125	0.09	391	840	0.12	413	1015	0.08	383	940	0.21	397	950	0.13	426	1550	0.08
29	404	1000	0.11	365	720	0.05	412	1170	0.07	424	1225	0.08	306	405	0.04	385	850	0.07	380	765	0.20	522	525	0.20	415	1500	0.09
30	371	845	0.09	422	1280	0.08	422	945	0.12	385	850	0.23	340	595	0.07	375	760	0.11	400	825	0.12	457	1575	0.30	412	1055	0.07
31	354	745	0.02	342	575	0.08	376	850	0.08	324	500	0.06	366	760	0.06	392	1000	0.12	411	950	0.26	451	1400	0.20	410	1140	0.14
32	414	1090	0.05	365	815	0.06	395	910	0.12	384	800	0.19	395	990	0.09	402	1030	0.19	399	1020	0.25	407	1175	0.26	402	1140	0.17
33	380	910	0.15	310	455	0.02	410	1140	0.08	315	450	0.07	357	700	0.06	409	1040	0.13	375	725	0.19	415	1250	0.08	396	900	0.39
34	355	680	0.18	355	715	0.04	375	850	0.16	280	300	0.08	368	740	0.06	358	645	0.07	412	1050	0.17	494	1700	0.55	358	850	0.07
35	441	1300	0.02	345	645	0.08	424	1395	0.12	475	1650	0.24	357	700	0.08	408	950	0.07	370	695	0.14	409	1175	0.12	330	535	0.11
36	376	850	0.36	355	680	0.04	406	960	0.08	418	1125	0.09	372	800	0.07	418	1050	0.14	370	650	0.13	480	2325	0.42	439	1310	0.35
37	370	855	0.08	390	895	0.05	342	660	0.08	368	820	0.06	415	1070	0.08	435	1510	0.21	425	995	0.18	345	650	0.13	416	1305	0.08
38	385	840	0.15	351	500	0.02	404	1050	0.08	372	800	0.07	445	1005	0.08	488	1700	0.35	458	1260	0.19	505	1950	0.35	405	1245	0.20
39	440	1460	0.15	214	120	0.01	335	580	0.09	408	890	0.07	300	595	0.06	390	965	0.06	455	1255	0.21	474	1950	0.18	456	1500	0.11
40	350	700	0.06	255	220	0.07	349	660	0.04	325	405	0.04	275	280	0.07	452	1450	0.20	414	1045	0.18	408	1075	0.09	430	1205	0.16
41	352	505	0.13	269	285	0.01	389	745	0.08	356	490	0.05	261	255	0.07	433	1545	0.09	440	1495	0.17	508	450	0.06	450	1545	0.18
42	382	760	0.19	432	1275	0.18	382	860	0.04	302	395	0.06	385	810	0.11	442	1445	0.08	424	1120	0.22	460	2075	0.30	407	965	0.09
43	405	1040	0.15	410	1005	0.15	385	860	0.08	382	845	0.04	405	1040	0.11	415	1100	0.10	428	940	0.16	457	1550	0.52	455	1450	0.15
44	357	525	0.11	485	1890	0.22	368	760	0.08	405	1080	0.07	408	1095	0.08	430	1440	0.15	395	995	0.39				485	1900	0.39
45				438	1400	0.05	405	980	0.09	342	500	0.05	375	755	0.06	409	1115	0.08	450	1460	0.15				441	1610	0.26
46				389	1005	0.09	488	1945	0.12	365	700	0.06	495	1720	0.14	410	1075	0.13	452	1290	0.21				500	430	0.05
47				375	890	0.04	396	915	0.05	387	790	0.09	398	845	0.08	443	1250	0.08	450	1180	0.11				428	1245	0.08
48				370	805	0.04	465	1790	0.34	357	500	0.07	385	770	0.09	415	1190	0.06	438	1235	0.17				489	1950	0.33
49				306	2345	0.32	426	1115	0.07	390	880	0.08	405	850	0.07	428	1090	0.14	455	1450	0.17				515	1995	0.32
50				446	1660	0.13	441	1400	0.06	485	1720	0.12	345	595	0.08	457	1400	0.08	412	1150	0.15				480	1815	0.30
51										459	1595	0.14															
52										391	1000	0.06															
53										382	800	0.06															
54										401	830	0.15															
55										402	100	0.08															
56										374	825	0.05															

Table A1.2. Fork lengths, round weights and muscle mercury concentrations of northern pike, 1987–88.

	South Bay						Camp 9			Area 4						Area 5						Isacett L.					
	1987			1988			1988			1987			1988			1987			1988			1987			1988		
Fish no	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)
1	645	1910	0.96	700	3050	1.33	542	1045	0.49	572	1250	0.49	611	1490	0.78	506	920	0.36	571	1090	0.63	840	4960	1.84	500	950	0.94
2	674	1940	1.00	557	1280	0.84	523	900	1.08	548	1000	0.80	607	1570	0.75	558	1200	0.71	510	1025	0.65	577	1320	0.69	514	1010	0.48
3	592	1010	1.27	615	1450	0.78	500	885	0.53	570	1250	0.71	473	745	0.44	545	1050	0.74	590	1500	0.62	604	1400	1.07	598	1345	0.92
4	760	2660	1.06	447	740	0.38	575	1200	0.75	475	700	0.55	520	1115	0.58	610	1750	0.99	605	1460	0.98	700	2390	0.82	866	4500	1.65
5	522	1100	0.08	595	1290	0.85	545	1060	0.49	555	1150	0.85	471	745	0.37	590	1160	0.97	628	1375	0.95	572	1160	0.70	785	3840	1.46
6	594	1540	0.73	833	4810	1.45	474	680	0.65	557	1050	0.70	545	1145	0.73	480	850	0.42	535	1145	0.72	475	860	0.44	292	165	0.15
7	538	990	0.49	585	1145	1.11	476	800	0.29	623	1700	0.62	537	950	0.90	528	1040	0.52	580	1355	1.06	518	1010	0.47	437	585	0.24
8	540	1110	0.68	504	720	1.14	484	660	0.90	507	825	0.60	574	1130	0.73	600	1450	0.72	645	1695	0.98	754	3700	1.13	660	2100	1.16
9	562	1160	0.61	439	620	0.36	479	660	0.31	406	475	0.37	578	1070	0.90	603	1450	0.54	578	1345	0.79	377	375	0.65	820	4300	1.49
10	590	1190	1.03	581	1060	0.66	530	855	0.95	415	500	0.25	572	1250	0.76	620	1450	0.66	698	2240	1.21	921	6450	1.27	830	3900	2.67
11	540	810	1.18	438	495	0.47	550	1170	0.50	465	650	0.35	604	1630	0.82	555	1250	0.60	628	1555	0.90	620	1575	0.75	640	1740	1.07
12	441	500	0.41	475	575	0.40	558	1000	0.73	607	1550	0.62	730	2590	0.85	537	1150	0.58	540	1150	0.80	578	1350	0.96	528	960	0.65
13	558	1205	0.45	572	1005	0.97	522	855	0.60	575	1050	0.80	520	845	0.71	610	1835	0.79	590	1355	0.89	853	5475	0.82	509	895	0.64
14	565	1140	1.17	466	645	0.50	612	1445	0.79	546	1025	0.86	553	1050	0.71	590	1355	0.91	540	1020	0.52	532	950	0.55	625	1600	0.71
15	720	2675	0.93	485	755	0.33	645	1570	0.73	602	1575	0.71	505	850	0.61	530	900	0.68	602	1280	0.57	608	1450	0.66	905	6155	1.00
16	635	2060	0.89	530	1140	0.45	599	1450	0.85	750	3025	0.98	655	1705	0.97				528	1145	0.71	624	1950	0.59	922	6195	1.91
17	530	1120	0.61	532	1210	0.53	568	1145	0.84	630	1900	0.63	688	2310	0.87				588	1255	1.01	691	2350	1.07	850	4510	2.00
18	567	890	1.27	515	1080	0.43	619	1545	1.14	615	1625	0.99	636	1700	0.73				481	780	0.62	660	2260	0.78	780	3990	0.91
19	508	825	0.69	575	1350	0.39	608	1500	0.77	525	1050	0.67	630	1605	1.04				585	1285	0.81	650	1790	0.69	610	1880	0.55
20	520	1005	0.34	579	1340	0.57	567	1040	0.87	494	875	0.47	619	1750	0.67				571	1375	0.76	604	1710	0.76	450	650	0.46
21	512	770	0.55	558	1090	0.62	607	1255	1.03				610	1500	0.91				636	1450	0.90	450	690	0.28	413	505	0.67
22	515	960	0.45	468	705	0.55	563	1045	0.70				634	1750	0.71				520	1095	0.70				451	555	0.76
23	558	1240	0.54	528	1100	0.46	622	1645	1.11				607	1440	0.71				525	1050	0.45				444	555	0.70
24	513	940	0.72	519	1150	0.39	555	1095	0.69				650	2090	0.98				558	1280	0.48				410	455	0.27
25	567	1095	0.60	557	1290	0.46	552	1110	0.46				505	805	0.65				628	1800	1.20				636	1745	0.85
26																			815	4200	1.93						

Table A1.3. Fork lengths, round weights and muscle mercury concentrations of walleye, 1987–88.

	South Bay						Camp 9			Area 4						Area 5						Izatt L.					
	1987			1988			1988			1987			1988			1987			1988			1987			1988		
Fish no	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)
1	386	655	0.48	443	840	0.57	387	655	0.45	442	1100	0.43	371	600	0.41	430	1060	0.39	433	940	0.84	390	710	1.19	388	700	0.62
2	428	1890	0.38	445	1005	0.60	314	310	0.28	367	475	0.40	431	940	0.58	430	1090	0.56	488	1145	0.96	410	810	1.48	383	650	0.91
3	220	100	0.58	409	840	0.40	323	380	0.36	399	750	0.35				424	900	0.67	403	750	0.42	425	980	1.63	427	855	0.98
4	395	715	0.40	289	245	0.54	386	645	0.43	384	575	0.26				535	1840	1.04	470	1070	1.10	358	510	0.39	239	150	0.42
5	401	660	0.75	258	200	0.44	468	1115	0.34							478	1360	0.76	434	960	0.62	533	1775	1.97	251	155	0.38
6	410	940	1.28	361	450	2.26	433	905	0.35							493	1575	0.77	437	1000	0.65	353	470	0.80	295	280	0.19
7				560	1745	2.88	426	835	0.25							390	700	0.45	389	650	0.41	373	610	0.38	441	955	1.62
8				357	445	0.59	391	670	0.27							420	950	0.69	416	955	0.64	334	440	0.43	390	725	0.62
9				385	580	0.41	427	870	0.59							423	1000	0.78	450	995	0.70	372	570	0.82	455	1150	1.53
10				417	755	0.89	375	650	0.26							390	740	0.42	450	1070	0.69	355	475	0.45	394	745	1.48
11				358	505	0.41	379	655	0.20							388	700	0.38	490	1345	0.77	447	1075	0.40	438	1055	1.32
12				398	645	0.75	410	775	0.34							390	650	0.41	451	1005	0.96	291	275	0.46	442	910	2.23
13				536	1790	1.94	417	850	0.37							306	310	0.57	455	1250	1.13	375	600	0.43	429	905	1.52
14				380	680	0.61	345	445	0.34							298	290	0.42	405	815	0.41	408	725	0.68	384	590	0.42
15				387	805	0.27	318	340	0.31							246	145	0.24	434	895	0.46	324	400	0.60	369	645	0.70
16				370	580	0.54	372	545	0.24							362	575	0.51	410	885	0.41	384	650	0.50	416	845	0.53
17				348	540	0.34	325	380	0.30							450	1110	0.55	431	915	0.75	405	750	0.42	456	1240	0.95
18				390	705	1.00	358	430	0.25							420	900	0.76	474	1250	0.40	357	550	0.43	401	690	0.65
19				398	845	0.62	366	510	0.28							412	820	0.67	448	1005	0.44	408	750	0.58	429	940	0.78
20				380	710	0.54	399	700	0.37							342	410	0.40	463	1160	0.41	403	750	0.42	423	840	0.53
21				390	760	0.60	393	740	0.40							368	560	0.45	451	1160	0.44	412	875	0.66	305	310	0.21
22				374	590	0.51	349	405	0.23							408	950	0.42	421	790	0.54	364	600	0.44	491	1378	1.53
23				403	685	0.56	456	1145	0.32										348	450	0.29	410	825	0.47	532	1790	1.89
24				411	880	0.38	457	1090	0.35										306	345	0.31	315	350	0.33	436	895	0.49
25				419	890	0.39													329	420	0.28	388	700	0.59	488	1260	1.60

Table A1.4. Fork lengths, round weights and muscle mercury concentrations of cisco, 1987–88.

	South Bay						Camp 9			Area 4						Area 5						Isacett L.					
	1987			1988			1988			1987			1988			1987			1988			1987			1988		
Fish no	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)
1	296	410	0.10	335	590	0.19	303	460	0.18	338	500	0.12	346	515	0.23	358	650	0.49	392	860	0.33	434	1510	0.62	336	610	0.19
2	301	400	0.22	355	815	0.35	238	170	0.13	351	550	0.09	341	550	0.24	306	450	0.18	344	575	0.29	452	1505	0.28	336	620	0.08
3	298	410	0.13	272	310	0.27	200	95	0.11	336	450	0.15	305	370	0.19	352	700	0.24	415	1070	0.30	396	900	0.72	321	650	0.20
4	343	600	0.15	334	700	0.27	235	170	0.13	345	575	0.11	342	645	0.27	245	215	0.09	355	650	0.17	310	495	0.17	422	1160	0.39
5	336	640	0.32	256	280	0.13	220	105	0.13	321	450	0.17	348	640	0.24	340	645	0.21	395	945	0.30	348	640	0.28	325	540	0.20
6	332	590	0.34	361	750	0.12	222	145	0.12	303	400	0.17	245	195	0.12	353	745	0.18	404	845	0.25	283	410	0.12	334	645	0.21
7	410	1345	0.42	368	790	0.27	209	105	0.08	307	400	0.14	287	345	0.11	331	555	0.21	371	645	0.32	298	340	0.32	330	510	0.15
8	282	345	0.20	369	760	0.29	195	95	0.07	311	400	0.15	298	345	0.13	178	55	0.05	301	400	0.20	342	515	0.23	306	495	0.11
9	315	450	0.14	356	515	0.31	313	400	0.16	340	575	0.13	328	495	0.11	329	540	0.15	401	1050	0.25	374	730	0.21	351	745	0.48
10	288	350	0.16	347	695	0.32	314	505	0.24	340	550	0.16	337	455	0.19	354	755	0.19	365	995	0.19	337	550	0.21	362	725	0.26
11	378	365	0.10	339	700	0.23	315	360	0.11	335	650	0.07	271	255	0.11				346	895	0.20	400	1100	0.24	289	395	0.15
12	271	290	0.11	331	610	0.29	338	545	0.27	240	150	0.10	331	455	0.14				366	865	0.17	363	800	0.34	290	405	0.08
13	328	515	0.12	350	745	0.25	283	410	0.18	372	700	0.11	299	330	0.16				393	1040	0.17	368	850	0.32	406	1155	0.50
14	326	490	0.26	348	750	0.28	237	180	0.11	353	650	0.22	278	280	0.06				150	50	0.08	378	850	0.25	393	1280	0.37
15	293	360	0.09	310	554	0.17	296	345	0.11	326	425	0.22	288	290	0.21				196	95	0.08	367	850	0.34	359	845	0.27
16	332	550	0.29	346	775	0.24	341	455	0.15	324	500	0.11	295	345	0.15				349	610	0.18	358	800	0.27	309	500	0.23
17	298	360	0.15	306	445	0.11	361	780	0.41	326	450	0.12	239	195	0.04				428	1085	0.29	365	675	0.18	365	855	0.18
18	322	400	0.17	325	600	0.24	366	640	0.24	291	375	0.10	287	300	0.15				384	910	0.17	330	550	0.39	373	740	0.26
19	383	1100	0.36	348	690	0.26	322	445	0.22	303	400	0.08	268	250	0.11				375	590	0.28				350	760	0.14
20	311	445	0.23	305	440	0.18	323	495	0.32	330	325	0.15	275	280	0.08				425	1205	0.36				352	745	0.12
21	308	410	0.24	294	390	0.17	332	470	0.27	317	425	0.18	289	355	0.13				342	640	0.18				394	1050	0.41
22	346	570	0.30	313	555	0.15	368	815	0.22	375	700	0.19	378	700	0.17				416	1115	0.28				382	1045	0.20
23	295	410	0.18	226	160	0.09	326	495	0.17	362	700	0.08	336	640	0.23				394	905	0.27				308	455	0.12
24	357	720	0.26	191	95	0.09	302	350	0.18	296	375	0.08	329	555	0.17				404	1005	0.30				248	200	0.08
25	296	350	0.23	222	110	0.08	342	690	0.20	310	400	0.08	356	755	0.25				403	1495	0.50				403	1200	0.27

Table A1.5. Fork lengths, round weights and muscle mercury concentrations of longnose sucker, 1987–88.

	South Bay						Camp 9			Area 4						Area 5						Isett L.					
	1987			1988			1988			1987			1988			1987			1988			1987			1988		
Fish no	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)
1	448	1220	0.13	553	1995	0.41	451	1310	0.12	349	650	0.09	441	1360	0.12	415	940	0.15	408	780	0.32	471	1650	0.12	437	1410	0.14
2	489	1645	0.15	418	1100	0.12	472	1540	0.09	370	725	0.07	396	905	0.08	480	1540	0.31	410	1000	0.20	438	1260	0.18	439	1290	0.17
3	416	1110	0.09	330	540	0.05	402	955	0.14	514	1700	0.28	504	1715	0.23	360	800	0.10	467	1355	0.23	430	1190	0.04	338	555	0.01
4	424	1220	0.11	468	1500	0.07	220	135	0.06	470	1400	0.17	406	950	0.08	380	795	0.09	372	745	0.08	463	1350	0.15	433	1140	0.05
5	465	1460	0.17	470	1350	0.25	236	180	0.06	367	750	0.09	398	995	0.06	450	1145	0.26	335	500	0.08	403	950	0.11	447	1450	0.18
6				478	1610	0.15	397	1015	0.08	471	1450	0.22	434	1045	0.12	420	880	0.10	430	1090	0.25	378	890	0.11	366	760	0.08
7				334	560	0.04	403	880	0.16	451	1300	0.19	378	860	0.08	397	860	0.05	378	915	0.11	424	1210	0.19	446	1500	0.08
8				427	1345	0.08	356	710	0.16	407	925	0.08	433	1130	0.12	412	1090	0.09	405	1100	0.09	432	1250	0.09	476	1960	0.24
9				479	1640	0.08	408	1095	0.08	416	1150	0.07	373	760	0.11	490	1600	0.26	343	600	0.07	383	900	0.08	220	150	0.03
10				435	1045	0.14	447	1355	0.11	446	1200	0.16	407	1040	0.08	390	890	0.08	468	1300	0.33	412	1125	0.08	354	730	0.03
11				405	1005	0.07	490	1555	0.33	447	1325	0.10	406	1020	0.09	445	1180	0.14	478	1400	0.22	488	1300	0.27	427	1155	0.13
12				484	1640	0.17	389	915	0.05	338	1075	0.18	367	710	0.11	455	1300	0.42	475	1610	0.31				395	1020	0.12
13				386	895	0.06	390	910	0.08	449	1300	0.33	374	890	0.08	428	1000	0.16	430	1150	0.29				426	1250	0.20
14				420	1100	0.13	410	1125	0.08	451	1175	0.17	409	1030	0.12	421	1200	0.16	418	1045	0.11				410	1090	0.05
15				356	558	0.03	434	1310	0.08	393	925	0.12	380	845	0.12	454	1300	0.37	398	900	0.12				445	1440	0.09
16				487	2010	0.08	430	1300	0.09	558	2325	0.28	399	1105	0.09	423	1200	0.23	378	835	0.13						
17				515	1900	0.18	500	1695	0.21	448	1450	0.11	418	1200	0.11	490	1500	0.29	460	1310	0.08						
18				435	1195	0.08	454	1415	0.16	410	950	0.09	420	1045	0.11	462	1310	0.17	435	1100	0.33						
19				435	1105	0.15	430	1160	0.11	450	1200	0.07	367	755	0.05	426	1000	0.11	380	880	0.13						
20				443	1400	0.08	535	2400	0.27	409	1025	0.09	385	855	0.12	419	1050	0.11	409	1030	0.08						
21				465	1610	0.13	428	1200	0.12	357	600	0.04	519	2050	0.29	412	1245	0.10	435	910	0.17						
22				454	1440	0.09	462	1570	0.15	390	1000	0.06	406	1055	0.09	490	1770	0.17	485	1495	0.22						
23				453	1650	0.15	535	2310	0.25	454	1500	0.10	404	1100	0.08	475	1450	0.29	440	1095	0.21						
24				502	1860	0.09	426	1180	0.08	453	1200	0.08	380	750	0.08	438	1250	0.29	410	975	0.11						
25				440	1050	0.03	419	1195	0.07	513	1850	0.18	372	850	0.06	450	1410	0.13	434	1000	0.52						

Table A1.6. Fork lengths, round weights and muscle mercury concentrations of burbot, 1987–88.

	South Bay						Camp 9			Area 4						Area 5						Isett L.					
	1987			1988			1988			1987			1988			1987			1988			1987			1988		
Fish no	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)	Fork length (mm)	Round weight (g)	Muscle [Hg] (μg/g)
1	610	1300	0.40	550	1060	0.35	480	750	0.21	690	1725	0.36	525	905	0.15	555	950	0.29	527	960	0.19	640	1450	0.28	694	2350	0.40
2				573	1000	0.40	518	1010	0.26	722	2375	0.35	635	1330	0.29	582	1100	0.37	503	890	0.18	515	960	0.31	537	1140	0.13
3				501	890	0.18	512	860	0.28	488	630	0.27	477	800	0.13	532	660	0.25	510	925	0.31				705	2620	0.45
4				522	895	0.18	556	1075	0.13	548	900	0.20	556	1080	0.22	622	1410	0.47	532	980	0.20				603	1455	0.36
5				436	645	0.16	479	695	0.14	510	750	0.30	493	670	0.18	590	1300	0.32	540	905	0.52				565	1150	0.28
6				526	865	0.18	568	1250	0.21	506	840	0.17	534	1030	0.15				518	1055	0.23						
7				693	2650	0.44	540	1010	0.35	535	925	0.17	554	1150	0.19				522	940	0.23						
8				545	1110	0.21	560	1200	0.17	510	860	0.22	515	875	0.18				504	1010	0.18						
9				552	1110	0.39	670	1300	0.36	515	850	0.17	580	1410	0.37				516	900	0.18						
10				637	2200	0.37	557	940	0.20	495	810	0.17	574	1095	0.20				638	850	0.53						
11				661	1554	0.82	542	1290	0.16	505	840	0.13	605	1380	0.24				540	1095	0.21						
12				474	760	0.21	580	1400	0.32	555	910	0.20	606	1250	0.22				554	1330	0.28						
13				475	760	0.15	505	1010	0.21	520	800	0.22	484	490	0.37				586	1150	0.39						
14				607	955	0.57	508	900	0.25	576	1090	0.21	576	1090	0.21				590	1310	0.29						
15							668	1950	0.27	595	1240	0.20	595	1240	0.20				550	1060	0.29						
16							569	1250	0.24	600	1345	0.27	600	1345	0.27				635	1520	0.24						
17							384	390	0.21	583	1045	0.24	583	1045	0.24				554	1275	0.20						
18							474	775	0.14	567	1095	0.28	567	1095	0.28				585	1400	0.24						
19							600	1395	0.22	570	1100	0.27	570	1100	0.27				536	1105	0.14						
20							632	1410	0.28	586	1300	0.23	586	1300	0.23				595	1260	0.39						
21							535	895	0.20	580	1295	0.21	580	1295	0.21				565	1065	0.20						
22							405	340	0.17	593	1255	0.22	593	1255	0.22				570	1195	0.33						
23							588	1180	0.27	582	1200	0.24	582	1200	0.24				581	1300	0.27						
24							615	1350	0.20	593	1145	0.28	593	1145	0.28				585	1240	0.27						
25							586	1340	0.21	570	1150	0.17	570	1150	0.17				630	1800	0.26						